

1 IN THE CLAIMS

2
3 Please amend claim 19 as follows:
4

5 19. (Amended) A method of improving mass resolution in
A' 6 time-of-flight mass spectrometry by compensating for an
7 initial velocity distribution of ions to at least second
8 order comprising:

- 9 a) applying a potential to a sample holder;
- 10 b) applying a potential to a first element spaced
11 apart from the sample holder which, together with
12 [a] ~~the~~ potential on the sample holder, defines
13 [an] a first electric field between the sample
14 holder and the first element;
- 15 c) ionizing a sample proximately disposed to the
16 holder to form sample ions;
- 17 d) applying a second potential to either the sample
18 holder or the first element at a predetermined
19 time subsequent to steps a) [and] through c)
20 which, together with the potential on the first
21 element, defines a second electric field between
22 the sample holder and the first element, and

1 which extracts the ions from the first element
2 after the predetermined time; and
3 e) energizing an ion reflector spaced apart from the
4 first element[.];
5 wherein the first and second electric fields and the
6 predetermined time are chosen such that a flight time of
7 extracted ions of like mass-to-charge ratio from the
8 reflector to a detector will be independent to second order
9 of the initial velocity.--

10

11

[Please add the following new claims:]

12

13 --26. The method of claim 1 wherein said method further
14 comprises the step of:

15 energizing an ion reflector remote from said
16 first region such that said ions from said
17 first region are reflected toward said ion
18 detector.

19

20 27. The method of claim 1 wherein said sample source is a
21 conductive metal grid.

22

1 28. The method of claim 1 wherein said sample source is a
2 dielectric surface.

3
4
5 29. The method of claim 1 wherein said sample source is a
dielectric surface with a thin film coating.

6 30. The method of claim 1 wherein said sample source is a
7 metal surface.

8
9 31. The method of claim 1 wherein said first region is
10 bound on one end by said sample source and on the other end
11 by a first electrode.

12
13 32. The method of claim 31 wherein said ions generated
14 from said sample source have an initial velocity component
15 perpendicular to said first electrode.

16
17 33. The method of claim 31 wherein said ions generated
18 from said sample source have an initial velocity component
19 parallel to said first electrode.

20
21 34. The method of claim 33 wherein said ions are
22 continuously generated from said sample source.

1 35. The method of claim 31 wherein said ions generated
2 from said sample source have an initial velocity component
3 perpendicular to said first electrode and an initial
4 velocity component parallel to said first electrode.

5
6 36. The method of claim 31 wherein said first electrode is
7 a grid.

8
9 37. The method of claim 31 wherein said first electrode is
10 a conductive plate having at least one hole.

11
12 38. The method of claim 31 wherein said first electrode is
13 a conductive plate having a plurality of holes.

14
15 39. The method of claim 31 wherein said first electrode
16 comprises a groove through the center of its surface for
17 receiving said sample source.

18
19 40. The method of claim 1 wherein said ions have a non-
20 isotropic initial velocity distribution.

21
22 41. The method of claim 1 wherein said ions are desorbed
23 from a surface.

1 42. The method of claim 1 wherein said ions have an
2 average initial velocity distribution not equal to zero.

3
4
5 43. The method of claim 1 wherein said ions have an
6 initial velocity component perpendicular to said sample
7 source.

8 44. The method of claim 1 wherein said ions have an
9 average initial velocity component greater than zero.

10
11 45. The method of claim 1 wherein a voltage pulse is
12 applied to said detector to increase the gain of said
13 detector.

14
15 46. The method of claim 1 wherein said method comprises
16 the further step of deflecting unwanted ions from the ion
17 path to the detector.

18
19 47. The method of claim 1 wherein said generating is fast
20 atom bombardment.

21
22 48. The method of claim 1 wherein said generating is
23 matrix assisted laser desorption.

1 49. The method of claim 1 wherein said generating is
2 plasma desorption.

3
4 50. The method of claim 1 wherein said generating is
5 secondary ion generation.

6
7 51. The method of claim 1 wherein said generating is
8 electron bombardment.

9
10 52. The method of claim 1 wherein said method further
11 comprises the step of employing an optimization method to
12 determine optimum values for the first field and the ion
13 accelerating field.

14
15 53. The method of claim 52 wherein said optimization
16 method is Simplex optimization.

17
18 54. The method of claim 1 wherein said ions are generated
19 from a DNA sample.

20
21 55. The method of claim 1 wherein said ions are generated
22 from a protein sample.

1 56. A time-of-flight mass spectrometer (TOFMS) for
2 determining the mass to charge ratios of accelerated ions,
3 wherein said TOFMS comprises:

4 a first region including a sample source disposed
5 therein;

6 an ion reflector remote from the first region;

7 an ion detector remote from said ion reflector;

8 means for establishing a first field within said
9 first region;

10 means for generating ions from said sample
11 source;

12 means for establishing a second field within said
13 first region at a predetermined time after
14 establishing said first field; and

15 means for energizing said ion reflector;

16 wherein said second field accelerates said ions
17 generated within said first region toward said reflector;
18 and wherein said reflector reflects said ions toward said
19 detector.

20
21 57. A TOFMS according to claim 56 wherein said first field
22 is zero.

1 58. A TOFMS according to claim 56 wherein said first field
2 is non-zero.

3
4 59. A TOFMS according to claim 56 wherein said sample
5 source is a conductive metal grid.

6
7 60. A TOFMS according to claim 56 wherein said sample
8 source is a dielectric surface.

9
10 61. A TOFMS according to claim 56 wherein said sample
11 source is a dielectric surface with a thin film coating.

12
13 62. A TOFMS according to claim 56 wherein said sample
14 source is a metal steel surface.

15
16 63. A TOFMS according to claim 56 wherein said first
17 region is defined by a first grid juxtaposed with a second
18 grid.

19
20 64. A TOFMS according to claim 63 wherein said TOFMS
21 further comprises a second region defined by a third grid
22 juxtaposed with said second grid.

1 65. A TOFMS according to claim 64 wherein a third field is
2 established in said second region.

3
4 66. A TOFMS according to claim 63 wherein said ions
5 generated from said sample source have an initial velocity
6 component perpendicular to said second grid.

7
8 67. A TOFMS according to claim 63 wherein said ions
9 generated from said sample source have an initial velocity
10 component parallel to said second grid.

11
12 68. A TOFMS according to claim 67 wherein said ions are
13 continuously generated from said sample source.

14
15 69. A TOFMS according to claim 63 wherein said ions
16 generated from said sample source have a first initial
17 velocity component perpendicular to said second grid and a
18 second initial velocity component parallel to said second
19 grid.

20
21 70. A TOFMS according to claim 63 wherein said second grid
22 is a conductive plate having at least one hole.

1 71. A TOFMS according to claim 63 wherein said second grid
2 is a conductive plate having a plurality of holes.

3
A2
cont
4 72. A TOFMS according to claim 63 wherein said first grid
5 has a groove through the center of its surface for
6 receiving said sample source.

7
8 73. A TOFMS according to claim 56 wherein said ions have a
9 non-isotropic initial velocity distribution.

10
11 74. A TOFMS according to claim 56 wherein said ions are
12 desorbed from a surface.

13
14 75. A TOFMS according to claim 56 wherein said ions have
15 an average initial velocity distribution not equal to zero.

16
17 76. A TOFMS according to claim 56 wherein said ions have
18 an initial velocity component perpendicular to said sample
19 source.

20
21 77. A TOFMS according to claim 56 wherein said ions have
22 an average initial velocity component greater than zero.

1 78. A TOFMS according to claim 56 wherein a voltage pulse
2 is applied to said detector to increase the gain of said
3 detector.

4
5 79. A TOFMS according to claim 56 further comprising a
6 deflector to deflect unwanted ions from the ion path.

7
8 80. A TOFMS according to claim 56 wherein said means for
9 generating said ions is fast atom bombardment.

10
11 81. A TOFMS according to claim 56 wherein said means for
12 generating said ions is matrix assisted laser desorption.

13
14 82. A TOFMS according to claim 56 wherein said means for
15 generating said ions is plasma desorption.

16
17 83. A TOFMS according to claim 56 wherein said means for
18 generating said ions is secondary ion generation.

19
20 84. A TOFMS according to claim 56 wherein said means for
21 generating said ions is electron bombardment.

1 85. A TOFMS according to claim 56 wherein an optimization
2 method is employed to determine optimum values for the
3 potentials and the predetermined times at which the
4 potentials are applied.

5 *As*
6 *(cont.)* 86. A TOFMS according to claim 85 wherein said
7 optimization method is Simplex optimization.
8

9 87. A TOFMS according to claim 56 wherein said ions are
10 generated from a protein sample.
11

12 88. A TOFMS according to claim 56 wherein said ions are
13 generated from a DNA sample.
14
15

A2
Cont.

89. A method of improving mass resolution in time-of-flight mass spectrometry, said method comprising the steps of:

applying a first potential to a sample holder;

applying a second potential to a first element spaced apart from the sample holder, wherein said sample holder and said first element defining a first region and wherein said first and second potentials define a first electric field in said first region;

ionizing a sample proximately disposed to the holder to form sample ions;

energizing an ion reflector spaced apart from the first element; and

changing the potential difference between the sample holder and the first element at a predetermined time which defines a second electric field between the sample holder and the first element to accelerate said ions from said first region toward said reflector;

wherein the first and second electric fields and the predetermined time are chosen such that the first and